Unconventional Monetary Policy, Exchange Rate Peg, and Refinancing Programs: Evidence from Jordan

Deema N. Azzam

Texas Tech University

December 9, 2025

Abstract

This paper examines how refinancing programs play a crucial role in monetary policy under constraints of a fixed exchange rate and limited fiscal space. Empirically, this study is motivated using a structural VAR incorporating an exogenous Federal Funds Rate shock and proxies for Jordan's main rate, refinancing activity, and key macroeconomic variables [1]. The identification strategy takes advantage of institutional features of the peg and refinancing program, investigating whether Central Bank concessional programs mitigate the spillover of U.S. interest rate induced shocks, while maintain the peg. I also propose a small open economy DSGE model with a hard exchange rate peg and a banking sector acting as an intermediary between households, firms, and the central bank. The model features two policy instruments; a main policy rate linked to an external anchor and a refinancing rate impacting the marginal cost of bank credit for economic sectors. Using the model, we can compare between a baseline economy mirroring a central bank using both the main policy rate and refinancing rate, against a counterfactual economy absent of refinancing schemes. Empirically, we find evidence that the CBJ effectively uses concessional spending to mitigate the impact of a rise in interest rate on the domestic economy.

[1] A special thank you to staff at the Central Bank of Jordan for providing data on the Hashemite Kingdom of Jordan's quarterly macroeconomic variables.

I Introduction

Monetary policy tools utilized by central banks globally have evolved over time to address economic recessions, especially following the 2007–2009 great financial crisis, adopting more unconventional monetary policy tools as key policy instruments (Borio and Zabai, 2016). In particular, when the Federal Funds Rate is constricted by the Zero Lower Bound, the United States' Federal Reserve (FED), employs tools such as forward guidance and balance sheet composition operations (quantitative easing) to achieve two main objectives: controlling inflation and employment. Over the past 20 years, a significant number of central banks have conducted operations largely limited in their excursion of conventional monetary policy, constricted by three restrictions: financial integration of dominant currencies, a limited fiscal space, and the employment of refinancing credit operation as a policy instrument. Worldwide exchange rate classifications indicate that pegged or restricted exchange rate regimes make up the majority of regimes in the world. In fact, only a small number of dominant currencies, such as the U.S. dollar and the euro, anchor world GDP. Mainly, this is done to stabilize domestic currencies against the dominant currency, maintaining attractiveness and reliability of the domestic currency in the global market. Simultaneously, fiscal space of global nations are not equally dispersed.

The IMF's Fiscal Monitor indicates that following the global pandemic, while developed economies posted significant amounts of discretionary fiscal spending such as stimulus checks, emerging economies where limited in exercising fiscal tools. This is primarily due to entering the pandemic with limited fiscal space, large public and private debt, and restricted market access, which "...laid bare major differences in the ability of countries to finance emergency spending to protect their people," (IMF, Fiscal Affairs Department, 2020). Thus, such countries must heavily depend on monetary policy tools or quasi-fiscal measures (performed outside the government budget). At the same time, decisions regarding interest rate changes and fiscal support face pressure through anchoring and domestic contains. Notably, through inflation concerns, public and private debt sustainability, exchange rate regimes, and domestic economy priorities regarding the labor market, investment, and credit. The maintenance of a hard exchange rate peg signals to both foreign and domestic monetary authorities (such as the IMF and World Bank) that the home nation is reliable and possesses good credit such that they may receive loans and grants. For many developing economies, these loans and grants are critical for economic sustainability and growth.

This paper examines how refinancing programs, such as in Jordan, play a crucial role in monetary policy under constraints of a fixed exchange rate and limited fiscal space. On the empirical

side, this study is motivated using a structural VAR incorporating an exogenous Federal Funds Rate shock and proxies for Jordan's main rate, CBJ refinancing activity, and critical macroeconomic variables such as output, consumption, inflation, and credit/ refinancing program (Claims on Other Depository Corporations— (Million J.D.)). The paper's identification strategy takes advantage of the peg and refinancing program's institutional features, investigating whether the CBJ concessional programs mitigate the spillover of U.S. interest rate induced shocks, while maintain the peg. On the theoretical side, I present a proposal for a small open economy DSGE model with a hard exchange rate peg, limited fiscal space, and a banking sector acting as an intermediary between households, firms, and the central bank. Two policy instruments are featured in the model. First, a main policy rate linked to an external anchor. Second, a refinancing (concessional) rate impacting the marginal cost of bank credit for economic sectors. Using the model, we can compare between baseline economy mirroring a central bank using both the main policy rate and refinancing rate, against a counterfactual economy absent of refinancing schemes.

We contribute to the literature by combining an SVAR using Jordanian data with a theory-grounded DSGE framework, linking measurable macroeconomic responses to a structural model explicitly modeling this refinancing channel in an economy; a vastly sparse area of research. Ultimately, we seek to address a critical central policy questions of not only Jordan, but similar economy using a similar unconventional monetary policy tool; to what extent does a refinancing program targeted vital economic sectors by subsiding the banking sector, act as a semi-independent monetary tool that effectively promoting domestic activity and growth, given constrictions of pegged exchange rate, limited fiscal space, and mostly non-autonomous main policy rate.

The relevance of this research is beyond only the Jordanian small open economy, but relates to an existing mechanism present in numerous advances and emerging economies. This is highlighted by the adoption of balance sheet operations, funding-for-lending schemes (refinancing facilities), and credit easing following the 2007-2009 Great Financial Crisis (Borio and Zabai, 2016). In the case of advanced economies, the European Central Bank's (ECB) Targeted Longer-Term Refinancing Operations (TLTROs), launched mid 2012, provide commercial banks with long-maturity funding at "attractive" rates explicitly linked to their individual lending performance to households and firms. This is done in order to "preserve favorable borrowing conditions for banks and stimulate bank lending to the real economy," (European Central Bank, 2022). Additionally, The Bank of England's Funding-for-Lending Scheme (FLS) "...encourages them [banks] to supply more credit by making more and cheaper funding available if they lend more," where easier credit conditions facilitate consumption and investment done by households and firms in the economy (Agarwal et al.,

2015; Bank of England and HM Treasury, 2012). These programs can be utilized to ease banking credit markets while not changing the main policy rates on a one-to-one basis.

Beyond advanced economies, the Reserve Bank of India's (RBI) TLTRO 1.0 and 2.0 initiatives were introduced during the 2020 pandemic, allowing banks to borrow from the RBI at the repo rate for three-year liquidity (tenors) by providing collateral in the form of government securities (Reserve Bank of India, 2020; Oguri, 2020). In Brazil, up to 40% of loans granted by private commercial banks are government sponsored, i.e. provided at subsidized rates (Ornelas et al., 2021; World Bank, 2007). As such, it is possible that lending rates may be less responsive to policy rates than in advanced economies with an autonomous main policy rate. Throughout various regional authorities, central banks already operate in environments where a main policy rate coincides with funding for ending channels, softening the impact of changes in the short term market rates by partly disentangling it from the effective borrowing costs faced by firms, households, and sectors in the market.

Jordan provides a particularly clean and policy-relevant environment to investigate these dynamics. Specifically, it faced a hard exchange-rate peg to the USD where the CBJ broadly tracks the FED's policy rate cycle while confronted with constrains including a restricted fiscal space that limits large-scale fiscal spending, and domestic demand concerns regarding employment, investment, and economic growth. By investigating Jordan's refinancing program using a combined empirical–theoretical framework using SVAR and DSGE, this paper speaks to relevant questions beyond one small open economy, but to a broader conversation at large. Firstly, this paper contributes to a wider discussion surrounding the spillovers of external dominant-currency shocks to official or de facto exchange rate pegs with restricted policy rate autonomy. Secondly, this research offers an internally consistent study of central banks operating under dual-instrument environments including both a main policy rate, anchored to external conditions, and a refinancing (concessionary) rate aimed at impacting at-home credit conditions while maintain currency attractiveness. Thirdly, this paper presents a template for capturing whether, and to what degree, targeted concessionary funding mitigates the transmission of global tightening cycles to domestic output and growth, given fiscal space limitations and constrained conventional monetary policy autonomy.

I.1 Background on Jordan's Monetary Policy

Jordan operates under two main constraints. The first being a fixed exchange rate of the Jordanian Dinar (JD) pegged to the U.S. Dollar at around 0.709 JD per USD since 1995, bolstered by an independent and active Central Bank of Jordan (CBJ) (International Monetary Fund, 2025).

The second constraint is the government's tight fiscal space where the public debt-to-GDP ratio has recently reached roughly 90% of GDP as of 2024, accompanied by a join Jordan-International Monetary Fund (IMF) consolidation plan to reduce this ratio to around 80% of GDP by 2028 (International Monetary Fund. Middle East and Central Asia Dept., 2023). These features of the Jordanian economy leave Jordan with limited room to exercise a conventional independent interest rate policy or a standard counter-cyclical fiscal support approach. As such, the CBJ must step in to address exogenous shocks, particularly U.S. FED rate cycles, while maintaining both the hard exchange rate peg and domestic macroeconomic stability and growth.

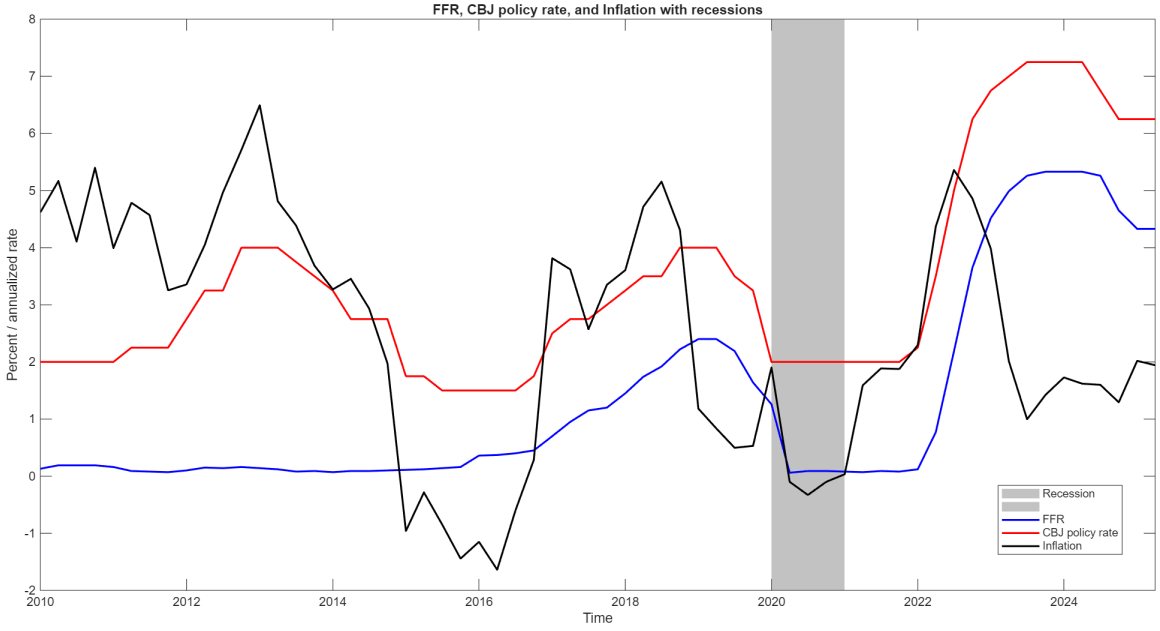
The global cycle of monetary policy tightening by central banks in 2022–2023 reflects this tension, following the COVID-19 induced stimulus policies of 2020–2021. The FED raided the federal fund rate target from a target range of 0.00-0.25 percent to 5.25-5.50 percent through 11 subsequent increases between the periods of early 2022 to mid 2023 (Federal Reserve, 2024). In order to maintain the Dinar's attractiveness in the global market and uphold the peg, the CBJ raised its main policy rates in conjunction, including its main policy rate and rediscount rate, among other policy instruments (of Jordan, 2024). These increases also tightened financial conditions in the domestic economy. This poses a problem in an economy with annual GDP growth around 2.4-3% and unemployment levels persistently around 21% (International Monetary Fund, 2024; World Bank, 2024). Moreover, any fiscal support is restricted by concerns regarding debt sustainability, hence the limited fiscal space. Higher market lending rates pose threaten credit, consumption, investment, and employment in the Hashemite Kingdom of Jordan.

To address domestic economy concerns and navigate these numerous constrains, the CBJ has expanded its unconventional monetary policy toolkit: targeted refinancing programs (started around 2010) providing ten-year loans to commercial banks through a concessional funding channel for ten "vital" sectors in the economy, valued at around JD 1.4 billion (of Jordan, 2024). This provides project within the Amman governorate (the capital of Jordan) an interest rate of 1% and an interest rate of 0.5% in other governorates (of Jordan, 2024). As stated by the CBJ's annual reports, this is in order to maintain the peg and monetary stability in the Kingdom, while fostering the growth and sustainability of the domestic economy. Throughout and following the global pandemic and global tightening cycle, this refinancing program expanded by JD 500 million through a "Finance Facilitation Program", supporting additional projects for Small and Medium-sized Enterprise (SMEs), craftsmen, individually owned small businesses and professionals (Jordan News Agency, 2020). Importantly, The CBJ maintained the refinancing rates while raising the main rate, certificates of deposit rates (CDs), and other monetary instruments. CDs help absorb excess liquidity in

the market and supporting the pegged exchange rate. In practice, this combination of tools means that Jordan can maintain the fixed exchange rate peg and attractiveness of the Dinar, while addressing domestic credit concerns derived from reduced interest rate autonomy through a separate refinancing program at concessional rates.

Given this backdrop, this paper is structured as the following: Section II provides a review the relevant literature surrounding our discussion, where section II.1 and II.2 provide literature reviews for theoretical and empirical strands, respectively. Section III presents the data and section IV the empirical methodology including the empirical identification scheme. Section V presents empirical results. Section VI outlines the preliminary outline for a DSGE specification; specifically, the main papers it extends upon, similarities, and key contributions. Section VII concludes and provides recommendations for future studies.

Figure 1: Time Series of FFRl, CBJ Main Rate, and Inflation



II Review of Related Literature

II.1 Theoretical Literature Review

This paper relates to many literature strands, both empirical and theoretical. In the theoretical sphere, papers like Christiano et al. (2005); Smets and Wouters (2007) provide a baseline conventional monetary policy model, lacking any frictions in financial markets. Therefore, these

models are no able to capture unconventional monetary policy tools or dynamics in loan markets. Other quantitative modeling of monetary policy works extend the standard New Keynesian DSGE, incorporating unconventional monetary policy. These structural models incorporate, to a degree, credit spreads, financial frictions, and attempt to capture the balance sheet behavior of the central bank. Gertler and Karadi (2011) provides a medium-scale New Keynesian DSGE with financial intermediaries facing balance sheet constraints. Their model incorporating financial frictions gives rise to a credit spread (endogenous) between a safe, risk-free, rate and banks' funding costs. Their credit policy instrument is separate for the bank's short-term interest rate. The Central Bank utilizes unconventional monetary policy by lending to banks (or buying private assets) which is added to their balance sheet, relaxing financial constraints on banks. They find that in times of crisis when credit spreads are high, credit policy targeting such spreads induce significant real effects. This is particularly true when the conventional Central Bank rate policy is constrained, such as by the Zero Lower Bound (ZLB). Cúrdia and Woodford (2009, 2016) construct a New Keynesian DSGE model including heterogeneous lenders and borrowers. Financial frictions similarly generate credit spreads. Their policy rule directly responds to inflation, output, and credit spreads.

Curdia and Woodford (2011) maintains the same model, however, explicitly models how Central banks can change the composition and size of their balance sheet, as well as duration of term credit, to address concerns in the macro economy. As such, it becomes a separate, unconventional tool from the conventional Central bank policy rate. Main findings include that optimal policy not only reacts to intonational and output, but credit market conditions as well. Even while the policy rate is constrained (e.g. ZLB), the balance sheet may be used as a tool to effectively improve welfare and address downturns in the economy (such as quantitative easing by purchasing longer term government bonds). Chen et al. (2012) investigates unconventional monetary policy effects on the macro economy by modeling large-sale asset purchase (LSAP) programs. In particular, the construct a U.S. DSGE with wage and price rigidities, and bond-market segmentation. This LSAP program involves the purchase of longer-term government bonds, shrinking the term premia. They find that the simulated LSAP induces moderate yet persistent increases in both inflation and GDP. As mentioned previously, even while the short rate is constrained by the ZLB, quantitative easing (QE) can be utilized as an affective tool to impact the economy.

Other papers model a small-open economy DSGE and small scale New Keynesian models (see Gali and Monacelli (2005); Laxton and Pesenti (2003); Ellison and Tischbirek (2014); Goodfriend and McCallum (2007); Galí and Monacelli (2016); Gilchrist et al. (2017); Orphanides and Wieland (1998).) In particular, Kolasa et al. (2012) constructs a small-open economy (SOE) DSGE,

explicitly incorporating a foreign block and central bank policies to do with the balance sheet. This is in order to investigate unconventional monetary policy (UMP) spillovers on economies with exchange rate exposure and foreign borrowing. Medina and Soto (2005) integrates financial frictions and external shocks into a SOE DSGE in an economy with oil finance. Karmelavičius and Ramanauskas (2019); Lyu et al. (2023) build a SOE DSGE with bank credit and money creation. Specifically, Karmelavičius and Ramanauskas (2019) models a SOE DSGE where the bank balance sheet constrains impact macroeconomic dynamics. It features a central bank which creates money and extends credit. Lyu et al. (2023) estimates a DSGE for the UK incorporating financial frictions and unconventional monetary policy in the form of quantitative easing (QE) balance sheet tools. Their model matches macroeconomic dynamics and term premia under unconventional monetary policies such as LSAPs. We contribute to this strand by outlining extensions a SOE DSGE, built on Cúrdia and Woodford (2016); Gertler and Karadi (2011) by incorporating a dual-instrument approach (main policy rate and a separate refinancing/credit policy instrument). Instead of LSAPs or other credit subsidies, we attempt to incorporate a concessional refinancing scheme at the central bank. The central bank will administratively set the refinancing rate and quantity. This is in an environment with a hard-pegged exchange rate and an exogenous foreign exchange rate shock (from the FED).

As it relates to DSGE literature surrounding Jordan and the MENA region as a whole, Beidas-Strom and Poghosyan (2011) models a Bayesian-estimated SOE New Keynesian DSGE for Jordan. This explicitly features habit formation, nominal rigidities, oil imports in consumption and production, and imperfect competition, using a standard Taylor-type interest rate rule. Exogenous foreign variables and risk-premium structures and used to tread the exchange rate peg. They find that key drivers of inflation d output are foreign demand and oil prices. The interest rate channel, while is active, is constrained by the hard exchange rate peg. They do not explicitly model unconventional tools or targeted refinancing or targeted concessional funding of commercial banks. Al-Sharkas et al. (2023) construct a semi-structural DSGE, modeling Jordan's Forecasting and Policy Analysis System (FPAS). They use a policy-oriented central bank Quarterly Projection Model (QPM), heavily reliant on the structural Jordan Analysis Model, known as JAM2.0, explicitly modeling the hard U.S. dollar peg, the nominal anchor being the exchange rate. They find that monetary policy autonomy in Jordan is constrained by the peg. They constructed structural frameworks allows for an analysis of trade-off given exogenous shocks, matching key stylized facts form the Jordanian economy. Their framework does not explicitly model UMPs used by the CBJ. Outside of Jordan, Oladunni (2020); Zhang et al. (2022) establish open economy DSGEs for economies who

are oil exporters and/or price sensitive, testing oil shocks and exchange rate impacts (e.g. Nigeria, China). Tavakolian and Ghiaie (2019) builds a SOE DSGE for an oil dependent economy with dual exchange rates that impact optimal inflation targeting.

We contribute to this strand of literature by keeping the hard exchange rate peg present in many Jordan DSGEs, however, explicitly incorporating a concessional credit spread (refinancing scheme) as a policy rule. We present a potential policy rule which ties together the refinancing rate commercial banks receive to the CBJ main rate. It is worth nothing that the certificates of deposit (CD) rate is quantitatively equivalent to the main rate, according to the CBJ 2024 Annual Report (of Jordan, 2024). A rise in the main rate decreases liquidity in the economy. The refinancing program, subsidizes in part by printing of money then increases liquidity. The central bank can utilize the issuance of CDs to absorb excess liquidity in the economy. In our model, the CBJ main rate and CD rate are identical (i_t). We attempt to tie to refinancing rule to CBJ's CD operations through calibration of the model. The baseline model, which has the refinancing scheme, is then compared to a counterfactual model without the concessionary behavior of the CBJ (setting the concessionary parameter to zero). Thus, we attempt to explicitly model this core policy transmitting mechanism in the CBJ's UMP, in the context of a hard exchange rate peg and tight fiscal space. This theoretical model will then be able to be mapped to an empirical application in the form of a structure SVAR, furthering bolstering the integrity of the results. In the empirical specification, we will incorporate data for the Federal Funds Rate, CBJ main rate (proxied by the short rate), refinancing quantity (proxied by Claims on Deposit– Money Banks).

II.2 Empirical Literature Review

Beyond the structural DSGE literature, this paper also appeals to the empirical strand of research. In particular, many papers utilize Panel and small scale VAR to investigate the spillovers of UMP to economies. Gambacorta et al. (2014) estimates a PVAR of eight economies whose central banks use balance sheet operations as a UMP tool. The find that balance sheet expansions (or quantitative easing) increase output and inflation in the short run. Weale and Wieladek (2016) estimate US and UK VARs utilizing comprehensive QE announcement shocks to the macro economy. They find that a 1% rise in the LSAP shock increases real GDP and CPI by approximately 0.50-0.65%, with differing transmission channels for each respective country. Peersman (2011); Elbourne et al. (2018) investigate the European Central Bank's (ECB) UMP shocks using structural VAR (SVAR) with sign and zero restrictions. They find positive macroeconomic effects however heterogeneous

responses across countries. Kim et al. (2023) isolate LSAP and forward guidance shocks in the U.S. using proxy-SVAR. They find that LSAPs had significant and meaningful effects on the real economy when controlling for the forward guidance policy of the central bank. Boeckx et al. (2019) stress that in the identification of pure UMP shocks for sign-restricted SVARs fails in some cases when using only balance-sheet data, emphasizing the need fr careful consideration of the identification scheme. Other papers explore funding-for-lending schemes and targeted refinancing facilities (concessions).

Churm et al. (2015, 2021) investigate UK Funding for Lending Scheme (FLS) utilizing an event study and macro model framework. They finding include that FLS reduces bank funding costs, supporting credit and output, while offering affordable lending-conditional (cheap) term funding. Descriptions of the FLS form the Bank of England highlight that long-term funding is offered to commercial banks against collateral (Bank of England, 2021). Thus, commercial banks have access to affordable funding from the central bank, given particular lending quantity targets. The incentive for banks to expand their lending in heightened by connecting loan growth to funding amounts and pricing. As such, concessional rates/ refinancing operations/ FLS are not only found in hard exchange rate peg, developing economies with limited fiscal space such as Jordan, but in developed economies such as the UK as well. Overall, this UMP is employed by various central banks around the world to subsidize commercial banks, stimulating economic activity, and mitigating negative macro effects on both the banking sector and households. Andreeva and García-Posada (2021) use bank-level panel data to study ECB Targeted Longer-Term Refinancing Operations (TLTRO I), finding that this funding induces a rise in lending to the real economy. A central channel for this transmission is the bank lending channel.

This work contributes this strand of literature by applying the logic of the FLS/TLTRO operations to the Jordanian CBJ refinancing program. This link is establishes that these programs are structurally similar where the central bank funds/subsidizes commercial banks with concessional rates in order to support credit. This paper employs an SVAR given an external Federal Funds Rate shock to investigate how CBJ refinancing reacts and the impact on the macro economy given this refinancing scheme. This baseline is then compared to a counterfactual which lacks this concessional activity. The methodology of UMP VAR research is thus adapted to a pegged exchange rate economy. The combination of the theoretical DSGE framework, further bolstered by the empirical case of Jordan's CBJ provides novel systemic macro-evidence on the CBJ's unconventional tool of the refinancing program, rather than only depicting it as a narrative policy device.

This research also appeals to empirical VAR and SVAR work specifically relating to Jordan and the wider MENA region, incorporating interest rate shocks. Poddar et al. (2006) investigate the

monetary transmission mechanism in Jordan using VAR/VECM incorporating Jordanian interest rates, credit, the exchange rate, output, and prices. The find that while the interest rate channel exists, it is weak relative to the importance of the bank-lending and exchange rate channels. As in theoretical findings, the USD peg limits monetary policy autonomy in Jordan. Mousa (2010) uses a VAR with six endogenous Jordanian variables: CBJ policy rate, broad money, credit, prices, output, and the exchange rate. The main findings emphasize the strong transmission of U.S. monetary policy to Jordan. The CBJ's goal of exchange rate stability dominates monetary policy decisions. In our framework and given this restriction on autonomous policy rate related decisions, the CBJ resorts to UMP, such as concessional rates, to mitigate negative spillovers to output and macro activity. Al-Sharkas (2004) uses a four variable VAR to investigate the response of output to shocks to the interest rate, inflation, and stock returns in Jordan. He find early evidence related to monetary transmission in the Hashemite Kingdom of Jordan where output responds negatively to interest rate shocks and positively to positive (favorable) stock market shocks.

Obeıdat et al. (2021) focuses on the lending channel in Jordan using time series data on Jordan, cointegration, VECM and causality tests. They find that the bank-lending channel in Jordan in active and that monetary policy impacts real activity and credit supply. That said, the peg molds the overall stance of monetary policy. Abouwafia and Chambers (2015) uses a structural PVAR of Jordan and four other Middle Eastern nations. The test exchange rate and monetary policy shocks and stock price reactions. They find that while exchange rate and monetary policy shocks impact stock prices, the magnitude and direction (sign) of such responses differ across countries. This demonstrates heterogeneity across the region and the significance of exchange rate regimes. Al Lozi (2023) uses a structural small scale VAR on a SOE (Jordan), incorporating the hard exchange rate peg. Confirming extensive literature, they find that U.S. monetary policy has a significant impact on Jordanian interest rates. Moreover, CBJ adjustments to the policy rate, induced by FED decisions, do not impact output largely. That said, interest rate differentials have a short run impact on inflation.

We contribute to this work by building upon a fixed exchange rate peg SVAR for Jordan while explicitly including data on CBJ refinancing quantity with the U.S. Federal Funds Rate as an exogenous shock. Critically, we are able to isolate responses of the CBJ policy rate and the CBJ refinancing/concessional tool. This will provide a direct test to the core hypothesis of the DSGE model: under a fixed peg, the policy rate follows that FED rate, harming the domestic economy. The refinancing scheme mitigates a portion of the negative effects on GDP and consumption. In other words, in this joint theoretical-empirical framework, the refinancing tool is embedded into a SOE

DSGE for Jordan, which is then mapped empirically into an macro-based SVAR for a particular country validating our theoretical structure. This will also test where this UMP tool actually mitigates harmful impacts of high policy rates to the macro economy or if it bring upon unintended consequences. The following section provides description of the variables utilized in the paper and where the data was sourced from. Additionally, we outline the methodology, and describe the identification strategy used in the structural VAR (SVAR).

III Data

We collect quarterly data on the U.S. Federal Funds Rate (FFR) from the Federal Reserve Bank of St. Louis (FRED) from 2010:1–2025:2. Jordanian quarterly macroeconomic variables for the same time periods are provided from staff at the CBJ including: Overnight Deposit Window Rate— Percentages (proxy for CBJ main rate), Claims on Other Depository Corporations— (Million J.D., CBJ balance sheet item, proxy for CBJ refinancing program subsiding commercial banks], Inflation Rate (%, YOY CPI, 2024 base year), GDP at Basic Prices— (Million J.D., expenditure-based), and Total Consumption (public and private). Annual consumption data is converted to monthly by the CBJ using "cubic interpolation". This method interpolated missing values between two points by drawing a smooth curve, providing a logical approximation for quarterly values. They employ the "quadsum" option such that the sum of four yearly quarters is identical to the initial annual numerical figure. These variables are selected due to their relevant to Jordan's main monetary policy instruments, CBJ balance sheet operations, and domestic development indicators. The recovered FFR residuals are employed as the exogenous monetary policy shock impacting Jordan.

IV Empirical Methodology

In the literature, there is little disagreement about how to estimate a vector autoregression (VAR) (Bloom, 2009; Jurado et al., 2015; Sims, 1980). Consider the following standard VAR model:

$$Y_t = \alpha + A_1 Y_{t-1} + ... + A_p Y_{t-p} + \varepsilon_t$$

where A_0 is the unconditional mean, $A_1, A_2, ...A_p$ are coefficient matrices given that p is equal to four lags, following the methodology. $Y_t, \varepsilon_t,$ and α all follow a 1xn vectors where n is the

number of variables. Here, Y_t are variables in our model, including the FFR shock and Jordanian macroeconomic variables. I follow the example of recursively sign identified models (Uhlig, 2005; Canova and De Nicolo, 2002) which allow a restrictions to be relatively flexible, relative to their counterparts which employ Cholesky decomposition ordering, imposing a zero restrictions on the contemporaneous correlation matrix, as highlighted by Székely (2020). The following is the recursive ordering:

$$Y_t = \begin{pmatrix} \text{FFR Shock}_t \\ \text{CBJ Policy Rate}_t \\ \text{Inflation}_t \\ \text{GDP}_t \\ \text{Total Consumption}_t \\ \text{Claims on Other Depository Corporation}_t \end{pmatrix}$$

The Cholesky ordering follows similar schemes for emerging economy empirical literature with pegged exchange rates such as Székely (2020). The ordering features has FFR first as an exogenous shock only contemporaneously impacting all other variables. CBJ policy rate closely follows FED monetary policy so it is not c contemporaneously impacted by inflation, GDP, total consumption, and Claims on other depository corporations. Inflation is contemporaneously impacted by FFR and the Policy rate but not contemporaneously by output, consumption domestically, or CBJ Commercial Banks claims. Output and consumption are contemporaneously impacted by the interest rate and inflation but themselves experience no contemporaneous impact, given Jordan's exchange rate peg to the USD. For identification using sign restrictions, we follow Darracq-Paries and De Santis (2015), imposing that a monetary policy structural shock has a negative impact on GDP and inflation, and a positive impact on interest rates. The response of Claims on Other Depository Corporations remains agnostic to monetary policy shocks which is key for capturing the real effects of the study.

Table 1: Identification strategy of benchmark model to structural shock

	Monetary Policy
CBJ Policy Rate	+
Inflation	-
GDP	-
Total Consumption	-
Claims on Other Depository Corporation	?

Note: "+" denotes a positive sign restriction, "-" denotes a negative sign restriction, and "?" denotes no restriction.

Structural shocks (residuals) are recovered from the FFR time series using an AR(2) process.

These shocks are them employed as the impulses for the Jordanian variables. For stationarity, CBJ policy rate, GDP, total consumption and claims are transformed to log difference, i.e. into the growth rates. For inflation, the first difference is taken as the original time series contains negative values. According to Bayesian Information Criterion, a lag order of three is chosen for the main VAR, resulting in a stable VAR with eigenvalues inside the unit circle. The structural rotation was accepted after 35 draws.

Table 2: ADF unit root tests before and after transformation

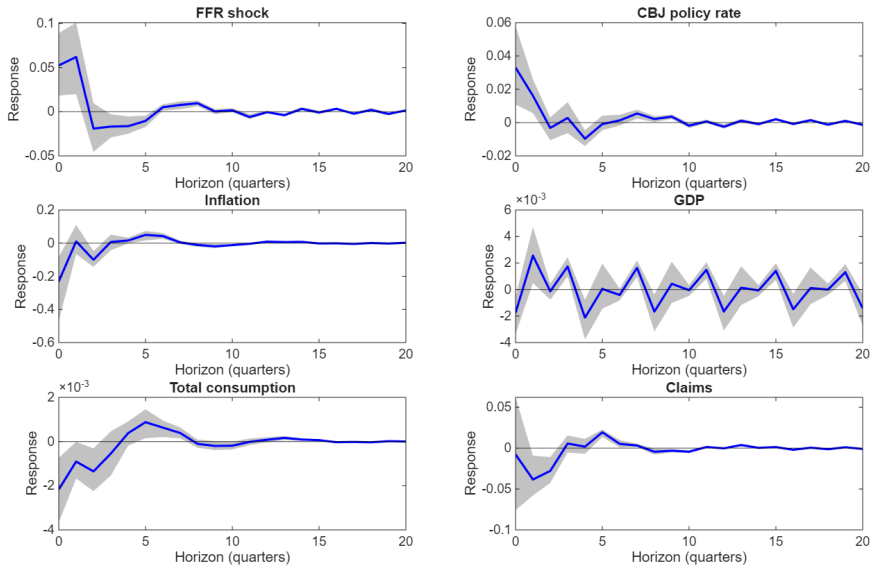
	ADF p-value	
Variables	Level	Transformation
CBJ policy rate	0.8967	0.0010***
Inflation	0.0913*	0.0010***
GDP	0.8053	0.0010***
Total consumption	0.9990	0.0140**
Claims (other depository corps)	0.4869	0.0010***

Note: Entries are p-values from Augmented Dickey–Fuller (ADF) tests of the null hypothesis of a unit root. "Transformation" denotes the log-difference or first difference used to obtain stationarity. *, **, and *** indicate rejection of the null at the 10%, 5%, and 1% significance levels, respectively.

V Results

Given the methodology discussed, the orthogonalized impulse response functions (IRFs) for Jordanian variables to an FFR shock is shown in figure 2.

Figure 2: Orthogonalized IRF of Jordanian Variables' Response to FFR Shock (65% CI)



In response to a positive one standard deviation FFR shock, CBJ policy rate gr (growth rate), inflation, GDP gr, and total consumption gr immediately move as expected, outlined by the structural sign restrictions, before returning to the steady state. CBJ policy rate gr moves with the FFR shock, immediately and temporarily depressing inflation, GDP gr, and total consumption growth rate. While claims is initially insignificant, it becomes significant after the 2nd quarter and becomes significantly positive by the 3rd quarter. It is notable to mention that while total consumption begins negative, it grows to a positive gr by the 4th quarter. This makes sense since the CBJ may have delayed response for Claims to Other Depository Corporations following the increase in its own short term policy rate in response to an FFR shock. The CBJ increases loans to commercial banks over the medium ter. This coincides with the initial story that while the CBJ defends the exchange rate peg by following U.S. momentary policy, in order to mitigate negative effects to the domestic economy, it accelerated refinancing operations and concessional spending. In response, increasing the total consumption grows at a positive rate around the same quarter that claims rise as well, as reflected by figure 2. In additional, despite the steep and sudden interest rate hike, consumption gr and GDP gr do not fall too strongly. In the future, as robustness checks, we may explore different sign restrictions and Cholesky orderings, as well as expand the Confidence Interval band to 90% as well. Moreover, we may evaluate additional CBJ balance sheet items and policy rates. Note that 65% was initially chosen as it is standard in the empirical macroeconomic literature.

Table 3: Forecast error variance share explained by FFR shock

	Horizon (quarters)			
	1	4	8	20
CBJ policy rate	0.075	0.059	0.060	0.060
Inflation	0.366	0.328	0.323	0.323
GDP	0.001	0.050	0.081	0.096
Total consumption	0.130	0.082	0.094	0.092
Claims	0.052	0.117	0.122	0.122

Notes: Entries are the shares of the forecast error variance of each variable accounted for by the FFR shock at horizons of 1, 4, 8, and 20 quarters.

We present the results of a forecast variance error decomposition exercise for each variable can be presented in table 3. An FFR shock explains 7.5% of variance in the CBJ policy rate gr in the first quarter, before declining to 6% by the 20th quarter. An FFR shock explains 36.6% of variance in inflation int he first quarter before persisting at 32.3% by the 20th quarter. 1% of variation in GDP gr is due to an FFR shock initially, before rising to 9.6% by the 20th quarter. Meanwhile, 13% of variation in total consumption is due to an FFR shock before settling at 9.2% by quarter 20.

Finally, FFR shock explains 5.2% of variance in Claims on Other Depository Corporations, before starkly rising to 12.2% by the 20th quarter.Overall, these proportions are quite consistent over time, indicating that Jordanian macroeconomic variables adjust relatively quickly to an FFR shock by the 4th quarter, before converging to a nearby steady state in the 20th period.

VI Theoretical Framework: Future Work

I build upon Cúrdia and Woodford (2009); Gertler and Karadi (2011); Maziad (2010). Particularly, Cúrdia and Woodford (2009) constructs a New Keynesian model integrating credit spreads as an additional policy dimension. The model generate in Gertler and Karadi (2011) includes the central bank utilizing its own balance sheet to impact bank credit at different rates and terms than the main central bank policy rate. We adapt these "credit policy / credit spread" methodologies to capture Jordan's refinancing program and fixed exchange rate. Below, i provide an overview of important equations relevant to the papers' application. Then, I loosely define a potential modifications while will be further developed in future work.

VI.1 Past Works

For Jordan, Maziad (2010) estimates the long-run relationship between variables, finding that a cointegration relation indeed exists between r domestic interest rate, $r*$ US interest rate, π inflation differential, and y output gap differential.

$$\bar{r} = 1.39 + 0.74r^* + 0.83\pi + 0.77y \tag{1}$$

This provides evidence that Jordan's policy rate moves strongly with the U.S. policy rate, while also responding to domestic inflation and activity.

Cúrdia and Woodford (2009) impose a central bank following Taylor rule:

$$\hat{i}_t^d = \phi_\pi \pi_t + \phi_y \hat{Y}_t + \varepsilon_t^m, \tag{2}$$

They model two different interest rates (policy tools) and a spread where i_t^d is the deposit (policy) rate and i_t^b is the borrowing loan rate:

$$1 + i_t^b = (1 + i_t^d)(1 + \omega_t), \tag{3}$$

After log linearization:

$$\hat{i}_t^b = \hat{i}_t^d + \hat{\omega}_t, \tag{4}$$

and the borrowers' Euler Equation must satisfy:

$$\lambda_t(i) = \beta\big(1 + i_t^b\big) E_t\left[\frac{\lambda_{t+1}(i)}{\Pi_{t+1}}\right]. \tag{5}$$

We exploit this existing construction as the literature considers this "spread" between the policy rate and the rate of borrowing as a discriminatory force on the transition of the policy rate to real allocations.

Beyond this, Gertler and Karadi (2011) utilizes the standard NK DSGE Taylor rule which defines monetary policy is written as:

$$i_t = (1-\rho)[i + \kappa_\pi \pi_t + \kappa_y(logY_t - logY_t^*)] + \rho i_{t-1} + \epsilon_t, \tag{6}$$

They introduce a separate credit policy instrument ψ_t which is the fraction of assets intermediates by the central bank. It has a linear response to credit spreads between the risky return R_{kt+1} and risk free return $R_t + 1$

$$\psi_t = \psi + \nu E_t\Big[\big(\log R_{k,t+1} - \log R_{t+1}\big) - \big(\log R_k - \log R\big)\Big] \tag{7}$$

We adapt this structure such that the CBJ's refinancing scheme is a separate unconventional tool that adjusts the spread between the main CBJ rate and the rate of concessional spending.

VI.2 Proposed Modifications

Given the established structures outlined in the previous section, we propose modifications to model refinancing programs in a small open economy such as Jordan. Building upon the Taylor-type rules defined prior, a peg-consistent Taylor-type rule can follow:

$$\hat{i}_t = \rho_i \hat{i}_{t-1} + (1-\rho_i)\Big[\phi_{i^*}\hat{i}_t^* + \phi_\pi\left(\hat{\pi}_t - \hat{\pi}_t^*\right) + \phi_y\left(\hat{y}_t - \hat{y}_t^*\right)\Big] + \varepsilon_t^i \tag{8}$$

where ρ_i: is the interest rate smoothing, ϕ_{i^*} close to 1 to respect the peg, and ϕ_π and $\phi_y > 0$ capture limited autonomy to respond to domestic inflation and output. This results in the main CBJ/CD rate i_t. Note that in the data, CBJ main rate and CD return are identical. The interest

subsidy given by the CBJ refinancing scheme is defined as an explicit wedge between the main policy/CD rate i_t, and the concessional refinancing rate i_t^R at which banks can borrow eligible loans from the CBJ. i_t^* is the US policy rate.

The Refinancing subsidy wedge/spread s_t is defined as:

$$s_t \equiv i_t - i_t^R, \qquad s_t \geq 0 \tag{9}$$

were i_t is the main CBJ rate, i_t^R is the concessional refinancing rate the CBJ offers commercial banks for eligible loans, and s_t responds to real activity and peg tightness. This mirrors Cúrdia and Woodford (2009) where they model borrowers paying "policy + spread". In my models' case. borrowers pay "policy - subsidy". This reflects the logic that s_t is the negative of a standard credit spread where it is not a cost but a subsidy.

The rule for the concessional spread is then:

$$\hat{s}_t = \rho_s \hat{s}_{t-1} + \psi_y \hat{y}_t + \psi_{\text{gap}}\left(\hat{i}_t - \hat{i}_t^*\right) + \varepsilon_t^s \tag{10}$$

where $\hat{s}_t$ is the deviation of s_t from its steady-state level $\bar{s}$, ρ_s is the persistence of the refinancing subsidy. Theoretically, when output is below potential $\psi_y < 0$, then the CBJ increases the subsidy. When the CBJ is forced to defend the peg give main rate deviation from the US rate, it increases the subsidy to shield domestic borrowers $\psi_{\text{gap}} > 0$.

Reorganizing equation (9), the refinancing rate is defined as:

$$i_t^R = i_t - s_t \tag{11}$$

This framework introduced a direct link between the main policy/CD rate and the unconventional concessional refinancing rate.

Next, we loosely and broadly outline how this may impact households and firms in the domestic economy block. The most tractable method to do this is to assume that the CBJ refinancing window funds a fraction λ of new loans to firms and/or households. Then, let the average bank funding rate be

$$i_t^F = (1-\lambda) i_t + \lambda i_t^R = i_t - \lambda s_t. \tag{12}$$

Suppose banks apply μ (constant markup) over funding costs on eligible loans to the targeted sectors in the economy, then the effective loan rate paid by eligible domestic borrowers is:

$$i_t^L = i_t^F + \mu = i_t - \lambda s_t + \mu. \tag{13}$$

The baseline model with the refinancing program theoretically has $\lambda > 0$, $s_t > 0$, such that i_t^L is partially protected from i_t interest rate hikes that come from thew pegged exchange rate, limiting conventional monetary policy autonomy. For the counterfactual analysis lacking the the unconventional program, then let $\lambda = 0$, $s_t = 0$, such that $i_t^L = i_t + \mu$.

Finally, substitution i_t^L into the standard Euler equations for consumption and investment of households and firms who borrow:

$$c_t^{-\sigma} = \beta(1 + i_t^L)\, \mathbb{E}_t \left[\frac{c_{t+1}^{-\sigma}}{\pi_{t+1}} \right], \tag{14}$$

A similar methodology can be followed for investment, working capital, and so on.

While this DSGE framework requires further development and consideration, it provides an environment to quantify the magnitude at which the CBJ's refinancing scheme shelters the domestic economy from interest rate hikes, given an exchange rate peg, limited fiscal space, and restricted conventional momentary policy autonomy. Given a positive i_t^* (Fed) shock, the policy rule forces i_t up., defending the peg. Without the refinancing scheme channel (i.e. $s_t = 0$), domestic loan rates jump one-for-one with the main rate, depressing output. However, With the refinancing scheme, s_t increases when the output gap worsens and the $i_t - i_t^*$ gap widens, limiting the pass-through of the hike to domestic borrowers.

VII Conclusion and Recommendation

This paper examines the utilization of refinancing programs, or concessional funding schemes, in monetary policy particularly under restrictions of pegged exchange rates and tight fiscal space. Empirically, we motivate this investigation using structural VAR with sign restrictions. An FFR shock is recovered using an AR(2) process, before using it to impulse Jordanian macroeconomic variables including: GDP, consumption, inflation, and credit/ refinancing program (Claims on Other Depository Corporations— (Million J.D.)). The identification strategy exploits institutional features of the peg and refinancing program, exploring if and how the CBJ concessional programs dampen the spillover of U.S. interest rate induced shocks, while supporting the peg. Theoretically, contributions to a small open economy DSGE is proposed incorporating hard exchange rate peg a intermediary banking sector interacting with households, firms, and the central bank. Two policy instruments are

featured in the model: (1) a main policy rate linked to an external anchor and (2) a refinancing rate impacting the marginal cost of bank credit for economic sectors. Empirically, we find evidence that the CBJ's Claims on other Depository Corporations have delayed increase, corresponding with the delayed rise in consumption growth rate and a muted depression in GDP. This bolsters the paper's initial claims regarding the employment of refinancing schemes to protect the domestic economy while the policy rate tracks its peg.

There is much room for future work building on the initial outline provide din this paper. Particularly, the identification strategy can be improved upon to ensure that the FFR shock is properly identified and the model is specified accurately. Additionally, the initial theoretical framework for the DSGE model shows great potential, however, requires further research and reading to accurately estimate. Nonetheless, this study not only has substantial policy implications for all countries dealing with exchange rate pegged and limited fiscal spaces, but nation in general who use refinancing schemes to support the domestic economy while not directly adjusting policy rate targets.

References

Abouwafia, H. E. and Chambers, M. J. (2015). Monetary policy, exchange rates and stock prices in the middle east region. *International Review of Financial Analysis*, 37:14–28.

Agarwal, S., Chomsisengphet, S., Mahoney, N., and Stroebel, J. (2015). Do banks pass through credit expansions to consumers who want to borrow? `https://www.philadelphiafed.org/-/media/frbp/assets/events/2015/consumer-finance/new-perspectives-2015/new-perspectives-2015-panel3-slides-mahoney.pdf`. Conference slides, Federal Reserve Bank of Philadelphia, New Perspectives on Consumer Behavior in Credit and Payments Markets, October 2, 2015.

Al Lozi, M. A. (2023). Identifying monetary policy under fixed exchange rates in a small open economy. *International Journal of Professional Business Review: Int. J. Prof. Bus. Rev.*, 8(10):15.

Al-Sharkas, A., Al-Azzam, N., AlTalafha, S., Shawish, R. A., Shalein, A., Rawwaqah, A., Al-Rawashdeh, A., Baksa, D., Karam, M. P. D., Karam, P., et al. (2023). *An Extended Quarterly Projection Model for the Central Bank of Jordan*. International Monetary Fund.

Al-Sharkas, A. A. (2004). Output responses to shocks to interest rates, inflation, and stock returns: Evidence from jordan. *Applied Econometrics and International Development*, 4(3).

Andreeva, D. C. and García-Posada, M. (2021). The impact of the ecb's targeted long-term refinancing operations on banks' lending policies: The role of competition. *Journal of Banking & Finance*, 122:105992.

Bank of England (2021). Terms and Conditions for the Funding for Lending Scheme. Technical report, Bank of England, London, United Kingdom. Accessed 2025-12-01.

Bank of England and HM Treasury (2012). Bank of England and HM Treasury announce launch of Funding for Lending Scheme. `https://www.bankofengland.co.uk/-/media/boe/files/news/2012/july/boe-and-hmt-announce-launch-of-funding-for-lending-scheme`. News release, published 13 July 2012. Accessed 2025-12-05.

Beidas-Strom, S. and Poghosyan, M. T. (2011). *An estimated dynamic stochastic general equilibrium model of the Jordanian economy*. International Monetary Fund.

Bloom, N. (2009). The impact of uncertainty shocks. *econometrica*, 77(3):623–685.

Boeckx, J., Dossche, M., Galesi, A., Hofmann, B., and Peersman, G. (2019). Do svars with sign restrictions not identify unconventional monetary policy shocks? Technical report, NBB Working Paper.

Borio, C. and Zabai, A. (2016). Unconventional monetary policies: A re-appraisal. BIS Working Paper 570, Bank for International Settlements.

Canova, F. and De Nicolo, G. (2002). Monetary disturbances matter for business fluctuations in the g-7. *Journal of Monetary Economics*, 49(6):1131–1159.

Chen, H., Cúrdia, V., and Ferrero, A. (2012). The macroeconomic effects of large-scale asset purchase programmes. *The economic journal*, 122(564):F289–F315.

Christiano, L. J., Eichenbaum, M., and Evans, C. L. (2005). Nominal rigidities and the dynamic effects of a shock to monetary policy. *Journal of political Economy*, 113(1):1–45.

Churm, R., Joyce, M., Kapetanios, G., and Theodoridis, K. (2015). Unconventional monetary policies and the macroeconomy: the impact of the united kingdom's qe2 and funding for lending scheme.

Churm, R., Joyce, M., Kapetanios, G., and Theodoridis, K. (2021). Unconventional monetary policies and the macroeconomy: The impact of the uk's qe2 and funding for lending scheme. *The Quarterly Review of Economics and Finance*, 80:721–736.

Cúrdia, V. and Woodford, M. (2009). Conventional and unconventional monetary policy. *FRB of New York Staff Report*, (404).

Curdia, V. and Woodford, M. (2011). The central-bank balance sheet as an instrument of monetarypolicy. *Journal of Monetary Economics*, 58(1):54–79.

Cúrdia, V. and Woodford, M. (2016). Credit frictions and optimal monetary policy. *Journal of Monetary Economics*, 84:30–65.

Darracq-Paries, M. and De Santis, R. A. (2015). A non-standard monetary policy shock: The ecb's 3-year ltros and the shift in credit supply. *Journal of International Money and Finance*, 54:1–34.

Elbourne, A., Ji, K., Duijndam, S., et al. (2018). The effects of unconventional monetary policy in the euro area. In *EUROFRAME Conference*, pages 1–26.

Ellison, M. and Tischbirek, A. (2014). Unconventional government debt purchases as a supplement to conventional monetary policy. *Journal of Economic Dynamics and Control*, 43:199–217.

European Central Bank (2022). Targeted longer-term refinancing operations (TLTROs). https://www.ecb.europa.eu/mopo/implement/omo/tltro/html/index.en.html. Accessed 2025-12-05.

Federal Reserve (2024). Monetary Policy and Economic Developments — Annual Report 2023. Technical report, Board of Governors of the Federal Reserve System. Accessed 2025-12-05.

Gali, J. and Monacelli, T. (2005). Monetary policy and exchange rate volatility in a small open economy. *The Review of Economic Studies*, 72(3):707–734.

Galí, J. and Monacelli, T. (2016). Understanding the gains from wage flexibility: the exchange rate connection. *American Economic Review*, 106(12):3829–3868.

Gambacorta, L., Hofmann, B., and Peersman, G. (2014). The effectiveness of unconventional monetary policy at the zero lower bound: A cross-country analysis. *Journal of Money, Credit and Banking*, 46(4):615–642.

Gertler, M. and Karadi, P. (2011). A model of unconventional monetary policy. *Journal of monetary Economics*, 58(1):17–34.

Gilchrist, S., Schoenle, R., Sim, J., and Zakrajšek, E. (2017). Inflation dynamics during the financial crisis. *American Economic Review*, 107(3):785–823.

Goodfriend, M. and McCallum, B. T. (2007). Banking and interest rates in monetary policy analysis: A quantitative exploration. *Journal of Monetary Economics*, 54(5):1480–1507.

IMF, Fiscal Affairs Department (2020). *Fiscal Monitor, October 2020: Policies for the Recovery*. International Monetary Fund, Washington, DC. Executive Summary.

International Monetary Fund (2024). Jordan — IMF Executive Board Concludes 2024 Article IV Consultation and Second Review Under the Extended Fund Facility. https://www.imf.org/en/news/articles/2024/12/13/pr-24467-jordan-imf-concludes-2024-aiv-consultation-and-second-review-under-the-eff. Press Release No. 24/467. Accessed 2025-12-05.

International Monetary Fund (2025). DQAF Metadata: Jordan – Exchange Rates (EXR00). https://dsbb.imf.org/sdds/dqaf-base/country/JOR/category/EXR00. Accessed 2025-12-01.

International Monetary Fund. Middle East and Central Asia Dept. (2023). Jordan: Sixth Review Under the Extended Arrangement Under the Extended Fund Facility and Request for Modification

of Performance Criteria-Press Release; and Staff Report. IMF Staff Country Report 2023/240, International Monetary Fund, Washington, DC. Country Report No. 2023/240, accessed 2025-12-02.

Jordan News Agency (2020). CBJ launches JD500 million Finance Facilitation Program for SMEs. `https://petra.gov.jo/Include/InnerPage.jsp?ID=23786&lang=en&name=en_news`. Accessed 2025-12-05.

Jurado, K., Ludvigson, S. C., and Ng, S. (2015). Measuring uncertainty. *American Economic Review*, 105(3):1177–1216.

Karmelavičius, J. and Ramanauskas, T. (2019). Bank credit and money creation in a dsge model of a small open economy. *Baltic journal of economics*, 19(2):296–333.

Kim, K., Laubach, T., and Wei, M. (2023). Macroeconomic effects of large-scale asset purchases: New evidence.

Kolasa, M., Rubaszek, M., and Skrzypczyński, P. (2012). Putting the new keynesian dsge model to the real-time forecasting test. *Journal of Money, Credit and Banking*, 44(7):1301–1324.

Laxton, D. and Pesenti, P. (2003). Monetary rules for small, open, emerging economies. *Journal of Monetary Economics*, 50(5):1109–1146.

Lyu, J., Le, V. P. M., Meenagh, D., and Minford, P. (2023). Uk monetary policy in an estimated dsge model with financial frictions. *Journal of International Money and Finance*, 130:102750.

Maziad, S. (2010). Monetary policy and the central bank in jordan. In *Money in the Middle East and North Africa*, pages 102–121. Routledge.

Medina, J. P. and Soto, C. (2005). Model for analysis and simulations (mas): A new dsge for the chilean economy. Technical report, Mimeo, Central Bank of Chile.

Mousa, N. Y. A. (2010). *Monetary policy and the role of exchange rate: the case of Jordan*. PhD thesis, University of Birmingham.

Obeıdat, M., Tarawneh, A., Khataibeh, M., and Omet, G. (2021). The lending channels of monetary policy transmission mechanisms: the case of jordan. *Journal of Economics Finance and Accounting*, 8(4):167–173.

of Jordan, C. B. (2024). Annual report 2024. Technical report, Central Bank of Jordan, Amman, Jordan. Accessed: 2025-12-01.

Oguri, J. (2020). RBI reinforce liquidity measures while keeping the interest rate constant. Technical report, Yale Program on Financial Stability, New Haven, CT. Accessed 2025-12-05.

Oladunni, S. (2020). Oil price shocks and macroeconomic dynamics in an oil-exporting emerging economy: A new keynesian dsge approach. *CBN Journal of Applied Statistics*, 11(1):1–34.

Ornelas, J. R. H., Pedraza, A., Ruiz-Ortega, C., and Silva, T. C. (2021). Credit Allocation When Private Banks Distribute Government Loans. Working Paper Series 548, Banco Central do Brasil, Brasília.

Orphanides, A. and Wieland, V. (1998). Price stability and monetary policy effectiveness when nominal interest rates are bounded at zero.

Peersman, G. (2011). Macroeconomic effects of unconventional monetary policy in the euro area. Technical report, ECB Working paper.

Poddar, T., Sab, R., and Khachatryan, H. (2006). The monetary transmission mechanism in jordan.

Reserve Bank of India (2020). Reserve Bank Announces Targeted Long-Term Repo Operations 2.0 (TLTRO 2.0). `https://www.rbi.org.in/commonman/english/scripts/PressReleases.aspx?Id=3207`. Press Release: 2019-2020/2237. Accessed 2025-12-05.

Sims, C. A. (1980). Macroeconomics and reality. *Econometrica: journal of the Econometric Society*, pages 1–48.

Smets, F. and Wouters, R. (2007). Shocks and frictions in us business cycles: A bayesian dsge approach. *American economic review*, 97(3):586–606.

Székely, B. (2020). Funding for lending schemes should prioritize sme lending. Technical report, Magyar Nemzeti Bank (Central Bank of Hungary).

Tavakolian, H. and Ghiaie, H. (2019). Optimal inflation targeting in a dualexchange rate oil economy (no. 2019-09). *THEMA (THéorieEconomique, Modélisation et Applications), Université de Cergy-Pontoise*.

Uhlig, H. (2005). What are the effects of monetary policy on output? results from an agnostic identification procedure. *Journal of Monetary Economics*, 52(2):381–419.

Weale, M. and Wieladek, T. (2016). What are the macroeconomic effects of asset purchases? *Journal of monetary Economics*, 79:81–93.

World Bank (2007). Brazil: The Industry Structure of Banking Services. Technical Report Report No. 40076-BR, World Bank, Washington, DC. Brazil Country Management Unit, Poverty Reduction and Economic Management Unit, Latin America and the Caribbean Region.

World Bank (2024). Jordan Economic Monitor – Summer 2024. https://www.worldbank.org/en/country/jordan/publication/jordan-economic-monitor-summer-2024. Accessed 2025-12-05.

Zhang, B., Ai, X., Fang, X., and Chen, S. (2022). The transmission mechanisms and impacts of oil price fluctuations: Evidence from dsge model. *Energies*, 15(16):6038.